

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus for printing graphical information on a surface, the apparatus comprising:

a print head for printing indicia on the surface;

an image sensor for recording an image of the surface, wherein the recorded image contains a position-coding pattern that identifies an absolute position on the surface; and

a processor for converting the recorded image into a recorded absolute position by: identifying a number of symbols in the recorded image; associating said symbols with one of a plurality of code windows on said surface, wherein each code window comprises a predetermined plurality of symbols that define a unique absolute position; and determining said absolute position based on the symbols of the associated code window, wherein

~~the recorded absolute position is defined by two coordinate values, and~~

the print head prints indicia on the surface based on a comparison of the recorded absolute position with the graphical information to be printed.

2. (Original) The apparatus of claim 1, wherein the graphic information is at least one of the following: textual information or non-textual image information.

3. (Original) The apparatus of claim 1, further including:
a memory for storing the graphic information in the form of a plurality of graphics positions.

4. (Previously Presented) The apparatus of claim 3, wherein said processor receives graphic information and converts the received graphic information into the plurality of graphics positions.

5. (Original) The apparatus of claim 4, wherein the processor transforms the graphics positions in the graphic information in response to an input signal containing transformation information.

6. (Original) The apparatus of claim 5, wherein the input signal is a start position recorded by the image sensor and coded in the position-coding pattern, such that one of the graphics positions corresponds to the recorded start position.

7. (Canceled).

8. (Original) The apparatus of claim 1, wherein the graphic information corresponds to a plurality of graphics positions, and wherein the print head prints indicia on the surface when the

recorded position corresponds to a graphics position in the graphic information.

9. (Original) The apparatus of claim 1, wherein the processor determines a predicted position of the print head from the recorded position, and wherein the print head prints indicia when the predicted position corresponds to a graphics position in the graphic information.

10. (Original) The apparatus of claim 9, wherein the processor determines a speed and a direction of the print head in relation to the surface based on at least two recorded positions determined from at least two recorded images, and wherein the processor calculates the predicted position based on the recorded positions and the speed and direction of the print head.

11. (Currently Amended) The apparatus of ~~claim 10~~claim 12, wherein the processor determines whether the speed of the print head in relation to the surface is constant, and wherein the processor terminates printing by the print head when the speed is changing in an amount greater than a predetermined acceleration threshold value.

12. (Original) The apparatus of claim 1, wherein the processor determines a speed and a direction of the print head in relation to the surface based on at least two recorded positions converted from at least two recorded images.

13. (Currently Amended) The apparatus of ~~claim 12~~claim 1, wherein the processor:

identifies a predetermined number of symbols in the position-coding pattern in the recorded image;

determines a first position code for a first coordinate and a second position code for a second coordinate by translating each symbol of the position coding pattern into a first digit for the first position code and into a second digit for the second position code; and

determines ~~the~~a first coordinate based on the first position code and determines ~~the~~a second coordinate based on the second position code.

14. (Original) The apparatus of claim 1, wherein the printer is a handheld device.

15. (Original) The apparatus of claim 1, wherein the image sensor has a main viewing direction for recording images on the surface, wherein the processor determines an angle of the viewing

direction with respect to the surface based on the recorded image, and wherein the print head prints indicia according to the determined angle.

16. (Original) The apparatus of claim 1, wherein the print head and the image sensor are located in proximity to one another such that the print head prints indicia on the surface at substantially the same point on the surface where the image sensor records the image.

17. (Original) The apparatus of claim 1, wherein the print head comprises a nozzle that prints indicia by dispensing ink on the surface.

18. (Original) The apparatus of claim 17, wherein the nozzle dispenses dye in a plurality of directions.

19. (Original) The apparatus of claim 1, wherein the print head comprises a heater that prints the indicia by heating the surface.

20. (Currently Amended) A system for printing graphic information on a surface having a position-coding pattern thereon, wherein an arbitrary subset of the position coding pattern defines

an absolute coordinate position on the surface, the system comprising:

a print head for printing indicia on the surface; and

an image sensor for recording an image of the surface,

wherein the print head prints indicia on the surface based on a comparison of the graphic information with the absolute coordinate position defined by a position-coding pattern in the recorded image,

wherein said system converts the recorded image into the absolute coordinate position by: identifying a number of symbols in the recorded image; associating said symbols with one of a plurality of code windows on said surface, wherein each code window comprises a predetermined plurality of symbols that define a unique absolute position; and determining said absolute position based on the symbols of the associated code window~~the absolute coordinate position being defined by two coordinate values.~~

21. (Original) The system of claim 20, further including a processor for determining a speed of the print head in relation to the surface, and wherein the processor terminates printing by the print head when the speed is changing in an amount greater than a predetermined acceleration threshold value.

22. (Currently Amended) A method for printing graphic information on a surface, comprising:

accessing graphical information to be printed on the surface;

recording an image of the surface;

deriving an absolute position from the recorded image by:
identifying a number of symbols in the recorded image; associating
said symbols with one of a plurality of code windows on said
surface, wherein each code window comprises a predetermined
plurality of symbols that define a unique absolute position; and
deriving said absolute position based on the symbols of the
associated code window; and

printing indicia on the surface based on a comparison of a recorded position derived from the recorded image and the graphic information, ~~wherein~~

~~the recorded position is defined by two coordinate values.~~

23. (Currently Amended) An apparatus for printing graphical information on a surface, the apparatus comprising:

a nozzle for dispensing dye on the surface;

an image sensor for recording an image of the surface, wherein the recorded image contains a position-coding pattern that codes an absolute position on the surface; and

a processor for converting the recorded image into a recorded absolute position, wherein the processor determines a predicted

position of the nozzle based on the recorded absolute position, wherein the nozzle dispenses dye on the surface when the predicted position corresponds to a graphics position in the graphical information, ~~and wherein the recorded absolute position is defined by two coordinate values.~~

24. (Currently Amended) An apparatus for printing graphical information on a surface, the apparatus comprising:

a print head for printing indicia on the surface;

an image sensor for recording an image of the surface, wherein the recorded image contains a position-coding pattern that codes an absolute position on the surface; and

a processor for converting the recorded image into a recorded absolute position, wherein the processor determines a predicted position of the print head based on the recorded absolute position, wherein the print head prints the indicia on the surface when the predicted position corresponds to a graphics position in the graphical information, ~~and wherein the recorded absolute position is defined by two coordinate values.~~

25. (Currently Amended) A system for printing graphical information, comprising:

a printing surface having a position-coding pattern thereon, wherein an arbitrary subset, having a predetermined size, of the

position-coding pattern identifies a unique absolute position on the printing surface, wherein each absolute position on the printing surface is coded by a group of symbols included in said position-coding pattern, such that a number of symbols may be associated with one of a plurality of code windows on said surface, with each code window comprising a predetermined plurality of symbols that define a unique absolute position~~the unique absolute position being defined by two coordinate values; and~~

a printing unit for printing the graphic information on the printing surface, wherein the printing unit further includes:

a print head for printing indicia on the printing surface; and

an image sensor for recording an image of the arbitrary subset on the printing surface,

wherein the print head prints indicia on the surface based on a comparison of the identified unique absolute position on the printing surface with the graphical information to be printed.

26. (Original) The system of claim 25, further including a processor for determining a speed of the print head in relation to the surface, and wherein the processor terminates printing by the print head when the speed is changing in an amount greater than a predetermined acceleration threshold value.

27. (Currently Amended) A hand-held printing device configured to print as the device is moved over a surface upon which is recorded a position-coding pattern, the hand-held printing device comprising:

a housing configured to be held by a user;

a print head in the housing;

a sensor in the housing for reading the position-coding pattern;

a processor for determining, as the housing is moved over the surface, an absolute location on the surface based on the position-coding pattern read by the sensor, and for causing the print head to print based upon the determined absolute location, wherein said processor identifies a number of symbols in the position-coding pattern read by the sensor; associates said symbols with one of a plurality of code windows on said surface, wherein each code window comprises a predetermined plurality of symbols that define a unique absolute position; and determines said absolute location based on the symbols of the associated code window~~wherein the determined absolute location is defined by two coordinate values.~~

28. (Canceled).

29. (Currently Amended) The apparatus of ~~claim 28~~claim 1, wherein each code window partly overlaps an adjacent code window such that these have at least one symbol in common.

30. (Previously Presented) An apparatus for printing graphical information on a surface, the apparatus comprising:

a print head for printing indicia on the surface;

an image sensor for recording an image of the surface, which contains a partial surface of a predetermined size of a position-coding pattern on the surface; said position-coding pattern being based on a cyclic number series, which has the characteristic that the position in the number series of each number sequence of a predetermined length is determined unambiguously and which is arranged a plurality of times on the surface with different rotations so that adjacent cyclic number series are displaced relative to each other by predetermined displacements; and

a processor for converting the recorded image into a recorded absolute position by identifying a plurality of said number sequences from the position-coding pattern on the partial surface; determining a position for each number sequence in said cyclic number series; on the basis of these positions, determining the displacements between the adjacent cyclic number series containing the number sequences from the partial surface; and determining, based on the displacements, said recorded absolute position;

wherein the print head prints indicia on the surface based on a comparison of the recorded position with the graphical information to be printed.

31. (Canceled).

32. (Currently Amended) The method of ~~claim 31~~claim 22, wherein each code window partly overlaps an adjacent code window such that these have at least one symbol in common.

33. (Previously Presented) A method for printing graphic information on a surface, comprising:

accessing graphical information to be printed on the surface;
recording an image of the surface, which contains a partial surface of a predetermined size of a position-coding pattern on the surface; said position-coding pattern being based on a cyclic number series, which has the characteristic that the position in the number series of each number sequence of a predetermined length is determined unambiguously and which is arranged a plurality of times on the surface with different rotations so that adjacent cyclic number series are displaced relative to each other by predetermined displacements;

identifying a plurality of said number sequences from the position-coding pattern on the partial surface;

determining a position for each number sequence in said cyclic number series;

on the basis of these positions, determining the displacements between the adjacent cyclic number series containing the number sequences from the partial surface;

deriving, based on the displacements, an absolute position for said partial surface; and

printing indicia on the surface based on a comparison of the derived absolute position and the graphic information.

34. (Canceled).

35. (Currently Amended) The system of ~~claim 34~~claim 25, wherein each of said symbols is included in several groups of symbols to thereby code several different absolute positions.

36. (Previously Presented) The system of claim 25, wherein said position-coding pattern has a smallest information-carrying entity, which contributes to the coding of more than one absolute position.

37. (Previously Presented) The system of claim 36, wherein said smallest information-carrying entity consists of at least one symbol.

38. (Canceled).

39. (Currently Amended) The hand-held printing device of ~~claim 38~~claim 27, wherein each code window partly overlaps an adjacent code window such that these have at least one symbol in common.

40. (New) The apparatus of claim 1, wherein said recorded absolute position is defined by two coordinate values.

41. (New) The system of claim 20, wherein the absolute coordinate position is defined by two coordinate values.

42. (New) The method of claim 22, wherein the recorded position is defined by two coordinate values.

43. (New) The apparatus of claim 23, wherein the recorded absolute position is defined by two coordinate values.

44. (New) The apparatus of claim 24, wherein the recorded absolute position is defined by two coordinate values.

45. (New) The system of claim 25, wherein the unique absolute position is defined by two coordinate values.

46. (New) The printing device of claim 27, wherein the determined absolute location is defined by two coordinate values.